



COGEN Europe

The European Association for the
Promotion of Cogeneration
(Combined Heat and Power - CHP)



Combined Heat and Power versus CCGT Power Stations

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Coverage



- What is CHP and what it is not
- Comparison of Efficiencies
- CHP costs versus CCGT costs
- Why it is easier to build a CCGT than a CHP plant?
- Recommendations and Policy Options

CHP not Combined Cycle



- CHP is the simultaneous generation of heat, power and sometimes cooling
- CCGT does not recover the waste heat
- Common mistake, politicians and journalists are guilty
- CCGTs are the most efficient and cleanest power only plants, but CHP is better because of heat recovery

What is Cogeneration?

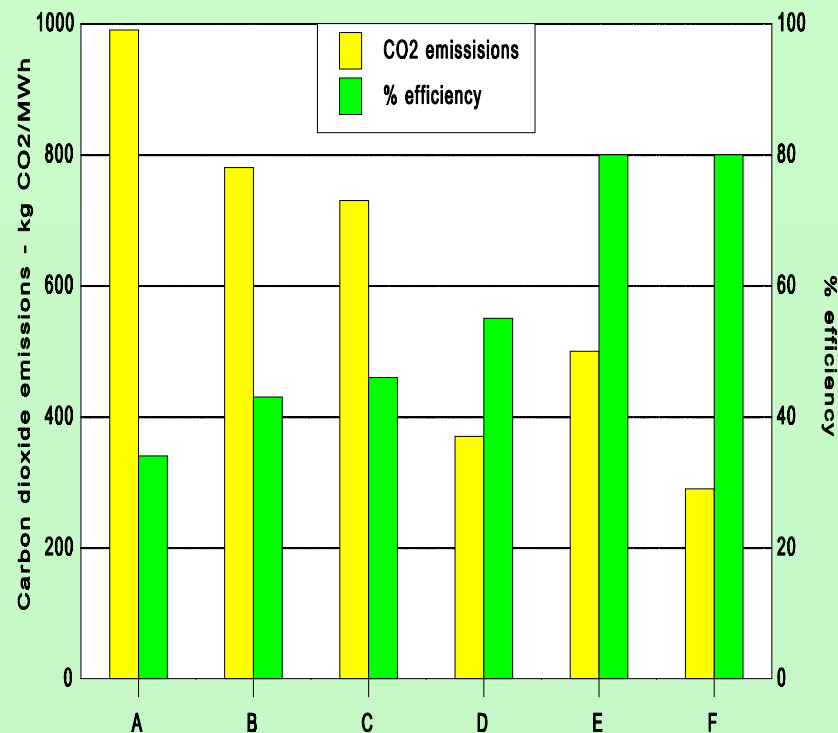


- Proven technologies available
- Environmental Benefits
 - Reductions in Carbon Dioxide 10-50%
 - Fuel savings and reductions in other pollutants
- Financial Benefits
 - Improved Financial Performance of Industry

Clear Benefits of Cogeneration



Carbon dioxide emissions, efficiencies
of power production



- A Coal-fired steam turbine**
- B New clean coal-fired station**
- C Coal gasification/steam turbine**
- D New combined cycle (CCGT)**
- E Coal cogeneration**
- F Gas cogeneration**

CCGT Efficiencies



- CCGT maximum efficiency 60% in theory
- US average is around 45%
- UK average is not much better
- In practice CCGTs generate at around 58% for best in class. In all year round operation down to 55%, then electricity transport losses - 2-3% thus 52% is realistic

CHP Efficiency - 1



- CHP efficiency up to 93%
- UK average is 82% all plants all ages all fuels - modern gas-fired greater than 85%
- European experience also suggests that 85% average is about what can be expected.
- The marginal electrical efficiency of a CHP plant is around 72% - How?

CHP Efficiency - 2



CHP Plant		
Electricity output	5	MW _e
Heat output	8	MW _t
Overall Efficiency	82%	
Fuel input	16	MW _f
Efficiency of heat only boiler	90%	
Fuel for heat only boiler	9	MW _f
Net fuel for electricity	7	MW _f
Marginal efficiency of CHP	72%	

Electricity Costs



The costs of supplying energy				
UK Model				
Generation Price - Pool Wholesale Price	2.4 p	3.8	US¢	
Electricity Cost - Large Consumer	3.5 p	5.6	US¢	
Electricity Cost - Medium Consumer	5.0 p	8.0	US¢	
Electricity Cost - Small Consumer	8.0 p	12.8	US¢	
Network cost to Large Consumer	1.0 p	1.6	US¢	
Network cost to medium consumer	2.3 p	3.7	US¢	
Network cost to small consumer	4.5 p	7.2	US¢	
Other costs - admin etc in standing charge				
This is similar to Finland where 50% energy 50% transport				

CCGT Costs



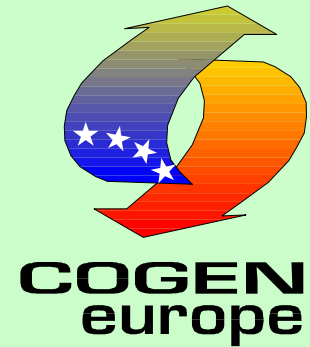
- Electricity export prices vary from 2.1 p/kWh to more than 3 p/kWh
- Grid costs not included
- Big projects involve big impacts on system
- These are not always factored in

CHP Costs



CHP Costs		
Fuel Price (gas)	1.5	p/kWh
Finance	0.5	p/kWh
Operation and Maintenance	0.5	p/kWh
Sub-total	2.5	p/kWh
Swing elements		
Connection Costs	10-20% of Capex	
Backup	greater current electricity price	
Standby	much greater than electricity price	
Export price	at least 10% less than wholesale price	

Market Problems



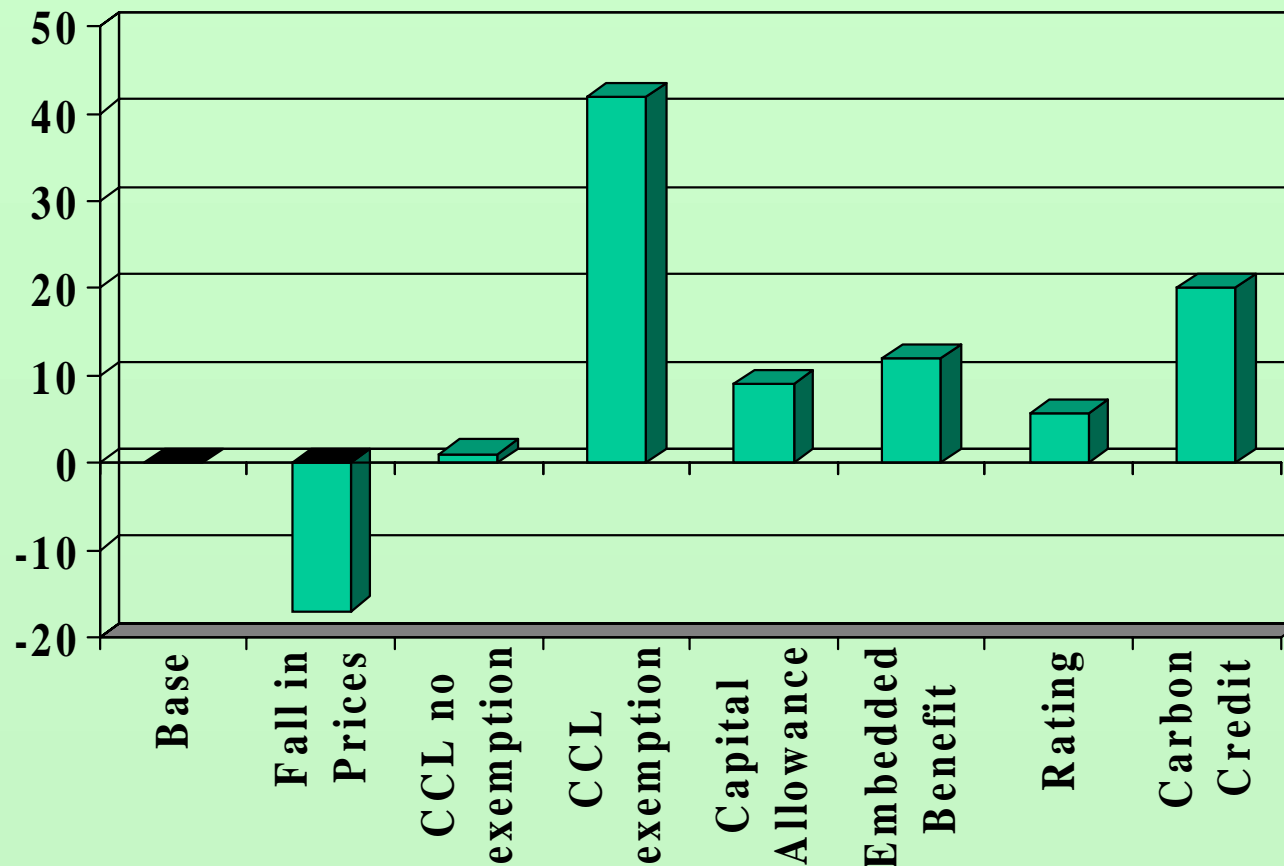
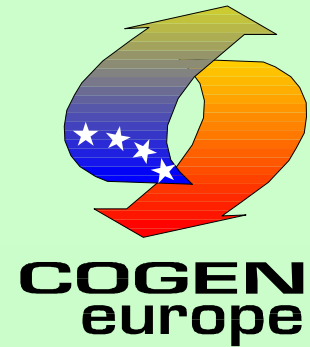
- System aspects favour traditional model
- Cogeneration suffers due to:
 - Connection costs
 - Standby and backup prices
 - Wholesale electricity pricing
 - Network costs
 - Hidden subsidies

Why is it easier to build a CCGT?



- Single product - electricity, no worries about heat
- Generally big so understood by banks, governments and electricity companies
- Fits the model of the market - centralised generation, transmission, distribution, consumption

Impact of Government Policies on Economics - % change in IRR





But What to Do?

It is a fight

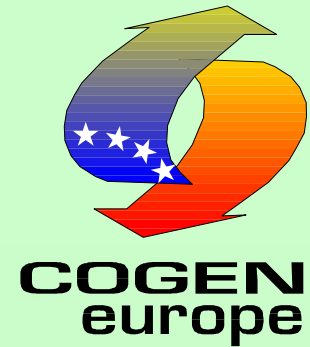
Existing interests will not give up
with out a fight!

COGEN Europe's Blueprint for Governments



- Use the market to achieve environmental objectives
- Remove the barriers
- Avoid heavy regulation
- Avoid subsidising pollution
- Set clear and ambitious CO₂ objectives
- Internalise environmental costs

National Action



- Targets
- Definitions
- National Planning Constraints
- Government Programmes
- Fiscal Measures
 - Accelerated depreciation
 - Rating System/VAT
 - Carbon taxation or a Climate levy
 - TPF/ESCOs
 - Grants and subsidies
- Interface with Electricity System
 - Transparency for connections
 - Load diversity benefits
- Standard Contracts for Small-Scale Cogeneration
- Gas Price Discrimination

Key Facts and Trends



- Challenges of environment, energy saving and fuel supply security
- New technologies open new doors
 - Micro turbines
 - Stirling Engines
 - Fuel Cells
- Natural gas the fuel of choice
- Political driving forces

Policy Trends



- Liberalisation/ Globalisation/ Privatisation
- Customer choice?
- Tightening Pollution Regulations
- Kyoto Commitments
- Policy Priority in Renewables, Efficiency and CHP
- Competition is King at the moment
- Energy Taxation ??

Liberalisation



- Good for cogeneration in general **IN THEORY**
- Monopolistic ESI stifles CHP development
- Decentralisation follows liberalisation
- But will not be the case if electricity anarchy occurs
- Liberalisation favours incumbents
- Must be regulated/re-regulated

Realising the Vision!



- Localisation is the vision of the future
- There are big challenges ahead, of course
- Cogeneration fits ideally with a sustainable energy future - the BRIDGE?
- Must co-ordinate actions and open the way for fair competition and transparent systems
- It is not just a dream, the world demands it!



Thank you for your attention



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